Space Weather Forecast

Issued on Tuesday, 18 July 2023 at 13:09 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 Blackouts likely throughout. Chance of Minor/Moderate Geomagnetic Storms during 20 July.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was Moderate, with several M-class flares observed. The largest was a long duration M5.7 peaking at 18/0005 UTC and originating from a large region in the southwest quadrant, near the horizon. at the end of the day and a number of Common class flares observed. The largest at 17/2359 UTC from a grouping of sunspots located in the southwest and currently nearing the limb. This large sunspot also generated a number of flares as did another large region in the northeast. There are currently eight sunspot regions on the visible disc. A number of CMEs (Coronal Mass Ejections) were observed leaving the Sun over the past 24 hours, however none of them are currently considered Earth-directed. The largest and fastest CMEs originated from a region located well beyond the western horizon. Further CMEs from the large region in the southwest have been analysed as not being Earth-directed.

Solar Wind / Geomagnetic Activity: The solar wind parameters are indicative of the waning influence of a magnetic cloud associated with a CME (the one which arrived on the 16th). The solar wind speed rose to 550km/s for a time but is now on the decline, currently around 510km/s. The total magnetic field has been weak. The important north-south component passed through a short period of negative strength but is now weak and mostly positive. This resulting in Unsettled to Active geomagnetic activity during much of the period although it has become Quiet during the last two intervals.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) became Moderate shortly after the long duration flare emitted by the large region in the southwest quadrant (near the horizon). The flux rose above the S2 threshold after 18/0200 UTC, reaching a peak of 620pfu at 18/0615 UTC, and is now declining slowly towards S1 levels.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to remain Moderate, with occasional M-class flares and a slight chance of an isolated X-class flare, probably from AR3373 in the northeast.

Solar Wind / Geomagnetic Activity: Current CME influence is expected to gradually ease into 19 July. A fast solar wind may connect with Earth but this is most likely to be masked by the already elevated solar winds originating from the mentioned CME. Another CME was observed leaving the sun after the M5.7 flare that occurred on 18/0000UTC. This may give Earth a glancing blow on the 20th (Day 3), with effect continuing into the 21st (Day 4). Geomagnetic activity is therefore expected to be Quiet to Unsettled on days 1 and 2 (18th & 19th) but largely Active with a chance of G1/G2 (Minor/Moderate) storms intervals on day 3 (20th). Activity returning to Quiet with a chance of Unsettled intervals early on day 4 (21st) as CME effects wane, but confidence is low as it will largely depends on the arrival time of the CME.

Energetic Particles / Solar Radiation: Further solar radiation storms are possible in the next 24hrs, should the large region in the southwest quadrant emit another large flare. This risk

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declines significantly over the following days as this region rotates onto the far side, with a daily slight chance of S1/Minor Storm threshold through the rest of the period.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	1	40	20
Strong	G3	No	1	1	10	5
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	80	70	70	70
Very Active	R3 to R5 X	No	20	15	15	15

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	Yes	100	20	20	20
Very Active	≥ S3 *	No	30	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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